Multiple Choice Questions

1.Which of the following correctly represents 360 g of water?
(i) 2 moles of H20
(ii) 20 moles of water
(iii) 6.022 × 1023 molecules of water
(iv) 1.2044×1025 molecules of water

(a) (i)
(b) (i) and (iv)
(c) (ii) and (iii)
(d) (ii) and (iv)

Soln:
Answer is (d) (ii) and (iv)

Explanation:

$$\text{Number of moles} = \frac{\text{Mass of water}}{\text{Molar mass of water}}$$

$$\text{Number of moles} = \frac{360\text{g}}{12\text{g/mol}}$$

Number of moles = 20

Number of molecules = $20 \times 6.022 \times 10^{23} = 1.2044 \times 10^{25}$ molecules of water

Thus, option (d) is correct.

2. Which of the following statements is not true about an atom?
(a) Atoms are not able to exist independently
(b) Atoms are the basic units from which molecules and ions are formed
(c) Atoms are always neutral in nature
d) Atoms aggregate in large numbers to form the matter that we can see, feel or touch

Soln:

Answer is d) Atoms aggregate in large numbers to form the matter that we can see, feel or touch

Explanation:

Atoms aggregate in large numbers to form the matter But we cannot see the matter with our naked eyes.

3. The chemical symbol for nitrogen gas is
(a) Ni
(b) N2
(c) N+
(d) N

Soln:

Answer is (b) N2

Explanation:
Chemical formula of Nitrogen is N but Nitrogen exist in molecule of two ions hence chemical symbol of Nitrogen is written as N2.

4. The chemical symbol for sodium is
(a) So
(b) Sd
(c) NA
(d) Na

Soln:

Answer is (d) Na

Explanation:

Sodium word is derived from Latin word Natrium hence the chemical name of sodium is Na.

5. Which of the following would weigh the highest?
(a) 0.2 mole of sucrose (C12 H22 O11)
(b) 2 moles of CO2
(c) 2 moles of CaCO3
(d) 10 moles of H2O

Soln:
Answer is (c) 2 moles of CaCO3

Explanation:

Weight of a sample in grant = Number of moles x Molar mass
(a) 0.2 moles of Ci2H220,, = 0.2 x 342 = 68.4 g
(b) 2 moles of CO is 2 x 44 is. 88 g
(c) 2 moles of CaCO? 2 x IIMI - 200 g (4) 10 moles of I-120 = 10 x 18 - 1St g
Hence, option (c) is correct.

6. Which of the following has maximum number of atoms?
(a) 18g of H2O
(b) 18g of O2
(c) 18g of CO2
(d) 18g of CH4

Soln:
Answer is (d) 18g of CH4

Explanation:

Number of atoms = Mass of substance × Number of atoms in the molecule/ Molar mass × NA

(a) 18 g of water =18 x3/18 ×NA = 3 NA

(b) 18 g of oxygen = 18 x2 /32 × NA = 1.12 NA

(c) 18 g of CO_2 = 18 x3/44 × NA = 1.23 NA

(d) 18 g of CH_4 =18 x5 /16 × NA = 5.63 NA

Note: NA = 6.023×10^{23}

7. Which of the following contains maximum number of molecules?

(a) 1g CO_2

(b) 1g N_2

(c) 1g H_2

(d) 1g CH_4

Soln:

Answer is (c) 1g H_2

Note: NA = 6.023×10^{23}

Explanation:

1 g of H_2 = ½ x NA = 0.5 NA = 0.5 × 6.022 × 1023 = 3.011 × 1023

8. Mass of one atom of oxygen is

(a) 23 16 g 6.023 10 ×

(b) 23 32 g 6.023 10 ×

(c) 23 1 g 6.023 10 ×

(d) 8u

Soln:

Answer is (a) 23 16 g 6.023 10 ×

Explanation:

Mass of one atom of oxygen = Atomic mass/NA = 16/6.023 × 1023 g

Note: NA = 6.023×10^{23}

9. 3.42 g of sucrose are dissolved in 18g of water in a beaker. The number of oxygen atoms in the solution are
(a) 6.68×10^{23} (b) 6.09×10^{22} (c) 6.022×10^{23} (d) 6.022×10^{21}

Soln:

Answer is (a) 6.68×10^{23}

Explanation:

1 mol of sucrose (C12H22O11) contains = 11× NA atoms of oxygen, where NA = 6.023×10^{23}
0.01 mol of sucrose (C12 H22 O11) contains = 0.01 × 11 × NA atoms of oxygen
= 0.11× NA atoms of oxygen
= 18 g/(1x2+ 16)gmol-1
=18 g /18 gmol-1
= 1mol
1mol of water (H2O) contains 1×NA atom of oxygen
Total number of oxygen atoms =
Number of oxygen atoms from sucrose + Number of oxygen atoms from water
= 0.11 NA + 1.0 NA = 1.11NA
Number of oxygen atoms in solution = 1.11 × Avogadro's number
= 1.11 × 6.022 ×10"^{23} = 6.68×10^{23}

10. A change in the physical state can be brought about
(a) only when energy is given to the system
(b) only when energy is taken out from the system
(c) when energy is either given to, or taken out from the system
(d) without any energy change

Soln:

Answer is (c) when energy is either given to, or taken out from the system

Short Answer Questions

11. Which of the following represents a correct chemical formula? Name it.
(a) CaCl
(b) BiPO4
(c) NaSO4
(d) NaS

Soln:

Answer is (b) BiPO4, Its name is Bismuth Phosphate

Explanation:

Bismuth phosphate is right because Both ions are trivalent Bismuth phosphate(Bi3+- Trivalent anion. anion is an ion that is negatively charged).

12. Write the molecular formulae for the following compounds

(a) Copper (II) bromide
(b) Aluminium (III) nitrate
(c) Calcium (II) phosphate
(d) Iron (III) sulphide
(e) Mercury (II) chloride
(f) Magnesium (II) acetate

Soln:

Answers are

(a) Copper (II) bromide- CuBr2

(b) Aluminium (III) nitrate = Al(NO3)3

(c) Calcium (II) phosphate - Ca3(PO4)2

(d) Iron (III) sulphide - Fe2S3

(e) Mercury (II) chloride - HgCl2

(f) Magnesium (II) acetate- Mg(CH3COO)2

13. Write the molecular formulae of all the compounds that can be formed by the combination of following ions Cu^{2+}, Na^{+}, Fe^{3+}, $C1^{-}SO_4^{-2}$, PO_4^{-3}

Soln:

Answers are

$CuCl_2$/ $CuSO_4$/ $Cu_3(PO_4)^2$

NaCl/ Na_2SO^4/ Na_3PO^4

$FeCl_3$/ $Fe_2(SO_4)^3$ / $FePO_4$

14. Write the cations and anions present (if any) in the following compounds

(a) CH_3COONa

b) NaCl

(c) H_2

(d) NH_4NO_3

Soln:

a) In CH_3COONa-CH_3COO is anion and Na is cation.

b) In NaCl-Cl anion Na is cation

c) In H_2 both the ions are cations as they share electrovalent bond between them

d) In NH_4NO_{3-} NO_3 is anion NH_4 is cation

15. Give the formulae of the compounds formed from the following sets of elements
(a) Calcium and fluorine
(b) Hydrogen and sulphur
(c) Nitrogen and hydrogen
(d) Carbon and chlorine
(e) Sodium and oxygen
(f) Carbon and oxygen

Soln:

(b) Hydrogen and sulphur- H_2S- Hydrogen Sulphide

(c) Nitrogen and hydrogen- NH_{3-} Ammonia

(d) Carbon and chlorine – CCl_{4-} Carbon Tetra chloride

(e) Sodium and oxygen – Na_2O-Sodium Oxide

(f) Carbon and oxygen- CO_2 ; CO- Carbon-di-oxide; Carbon Monoxide

16. Which of the following symbols of elements are incorrect? Give their correct symbols
(a) Cobalt CO
(b) Carbon c
(c) Aluminium AL
(d) Helium He
(e) Sodium So

Soln:

Cobalt CO is wrong, correct symbol is Co

Carbon c is wrong, correct symbol is C

Alluminium AL is wrong, correct symbol is Al

Helium He is the right symbol

Sodium So is wrong, correct symbol is Na

17. Give the chemical formulae for the following compounds and compute the ratio by mass of the combining elements in each one of them. (You may use appendix-III).

(a) Ammonia

(b) Carbon monoxide

(c) Hydrogen chloride

(d) Aluminium fluoride

(e) Magnesium sulphide

Soln:

Sl. No.	Compounds	Chemical formula	Ratio by mass of the combining elements
(a)	Ammonia	NH_3	N:H=14:3
(b)	Carbon monoxide	CO	C:O= 12:16=3:4
(c)	Aluminium fluoride	HCl	H:Cl= 1:35.5
(d)	Aluminium fluoride	AlF_3	Al:F=27:57=9:19
(e)	Magnesium sulphide	MgS	Mg:S= 24:32=3:4

18. State the number of atoms present in each of the following chemical species

(a) $CO3^{-2}$

(b) $PO4^{-3}$

(c) $P_2 O^5$

(d) CO

Soln:

(a) $CO3^{-2}$ **- 1+3=4**

(b) $PO4^{-3}$ **-1+4=5**

(c) $P_2 O^5$ – **2+5=7**

(d) CO – **1+1=2**

19. What is the fraction of the mass of water due to neutrons?

Soln:

Mass of 1 mole of a substance is equal to its relative atomic or molecular mass in grams.

Mass of one mole (Avogadro Number) of neutrons =1g

Mass of one neutron = 1/ Avogadro number(NA) g

Mass of one molecule of water = Molar mass / NA = 18/ NA g

The molar mass of water is 18.015 g/mol. This was calculated by multiplying the atomic weight of hydrogen (1.008) by two and adding the result to the weight for one oxygen (15.999)

Mass of one molecule of water = Molar mass / NA = 18/ NA g

Avogadro number(NA) =6.022 x 1023mol¯1

There are 8 neutrons in one atom of oxygen

Number of neutrons in oxygen= number of oxygen - Atomic number of oxygen

Oxygen's atomic weight= 15.9994
increases with an increase in temperature.
Therefore the mass is 16

Therefore number of neutrons= 16 - 8 = 8

Mass of one neutron = 1/ Avogadro number(NA) g

Mass of 8 neutrons = 8/ Avogadro number(NA) g

Fraction of mass of water due to neutrons = 8/18 g

20. Does the solubility of a substance change with temperature? Explain with the help of an example.

Soln:

Solubility is the ability of a solute to get dissolved in 100g solvent. Solubility of a given solute to dissolve in specific solvent depends on the temperature. With Increase in temperature solubility of liquids and solids increase. In the same way solubility of gases decreases with increase in temperature.

Ex: Sugar dissolves faster in hot water than in cold water.

21. Classify each of the following on the basis of their atomicity.
(a) F2
(b) NO2
(c) N2O
(d) C2H6
(e) P4
(f) H2O2
(g) P4O10
(H) O3
(i) HCl
(j) CH4
(k) He
(l) Ag

Soln:

a) Monoatomic are inert gases that do not combine and exist as monoatomic gases
b) Diatomic- (a) 2- diatomic- NO_2 = 1+ 2 = 3., HCl = 1+ 1 = 2
c) Triatomic-N_2O = 2 + 1 = 3., NO_2 = 1+ 2 = 3, O_3 = 3
d) Tetraatomic- H_2O_2 = 2 + 2 = 4, P_4O_{10} = 4 + 10 = 14, P_4 = 4, CH_4 = 1+ 4= 5
e) Octa atomic- C_2H_6 = 2 + 6 = 8
f) Polyatomic.

22. You are provided with a fine white coloured powder which is either sugar or salt. How would you identify it without tasting?

To examine if the fine white coloured powder is sugar pr salt we can conduct two experiments.

Soln:

1. Heating: Upon heating sugar melts to liquid form because sucrose has a decomposition point and melting point at temperatures between 190 to 192 degrees Celsius. This will turn sugar to light brown colour. Upon heat further sugar gets charred to black colour.

Salt has a melting point of 841 degrees Celsius and 1545.8 degrees Fahrenheit. If we don't heat it to that point nothing change is observed.

2. Electric conductivity:

If we dissolve the given substance in water we can check for electric conductivity to check whether the substance is sugar or salt. If it is salt it conducts electricity. Because salt (NaCl) has positive sodium ions and negative chloride ions hence salt conducts electricity. But sugar don't conduct electricity as sugar has only positive ions.

23. Calculate the number of moles of magnesium present in a magnesium ribbon weighing 12 g. Molar atomic mass of magnesium is 24g mol–1.

Soln:

$$\text{Number of moles} = \frac{\text{weight}}{\text{atomic weight}}$$

$$= \frac{12}{24} = 0.5 \text{ moles}$$

Long Answer Questions

24. Verify by calculating that (a) 5 moles of CO_2 and 5 moles of H_2O do not have the same mass. (b) 240 g of calcium and 240 g magnesium elements have a mole ratio of 3:5.

Soln:

(a) Molar mass of CO_2 =12 + 2 x 16= 12 + 32 = 44 g mol^{-1}

5 moles of CO_2 have mass = 44 x 5 = 220 g

Similarly, molar mass of H_2O = 2x 1 + 16 = 18 g mol^{-1}

5 moles of H2O have mass =18 x 5 = 90 g

It is verified that 5 moles of CO_2 and 5 moles of H_2O are not same.

(b) Number of moles = w/ atomic weight

Atomic weight of Ca= 40 amu

Number of moles in 240g Ca metal 240/ 40 = 6

Number of moles in 240g of Mg metal 240/ 24 = 10

Atomic weight of Mg = 24amu

Ratio 6:10

25. Find the ratio by mass of the combining elements in the following compounds. (You may use Appendix-III) (a) CaCO3 (d) C2H5OH (b) MgCl2 (e) NH3 (c) H2SO4 (f) Ca(OH)2

Soln:

a) CaCO3

Ca: C : O × 3

40 : 12 : 16 × 3

40: 12 : 48

10 : 3 : 12

(b) MgCl2

Mg : Cl × 2

24: 35.5 × 2

24: 71

(c) H2SO4

H x 2 : S : O × 4

2: 32 : 16 × 4

2 : 32 : 64

1: 16: 32

(d) C2H5OH

C × 2 : H × 6 : O

12 × 2 : 1 × 6 : 16

24 : 6 : 16

12 : 3 : 8

(e) NH_3

N : H × 3

14 : 1 × 3

14: 3

(f) $Ca(OH)_2$

Ca : O × 2 : H × 2

40 : 16 × 2 : 1 × 2

40 : 32 : 2

20 : 16 : 1

26. Calcium chloride when dissolved in water dissociates into its ions according to the following equation. $CaCl_2 (aq) \rightarrow Ca^{2+} (aq) + 2Cl^{-} (aq)$ Calculate the number of ions obtained from $CaCl_2$ when 222 g of it is dissolved in water.

Soln:

1 mole of calcium chloride = 111g
Therefore 222g of $CaCl_2$ is equivalent to 2 moles of $CaCl_2$
Since 1 formula unit $CaCl_2$ gives 3 ions,
therefore, 1 mol of $CaCl_2$ will give 3 moles of ions 2 moles of $CaCl_2$ would give 3×2=6 moles of ions.

No. of ions = No. of moles of ions × Avogadro number

$= 6 \times 6.022 \times 10^{23}$

$= 36.132 \times 10^{23}$

$= 3.6132 \times 10^{24}$ ions

27. The difference in the mass of 100 moles each of sodium atoms and sodium ions is 5.48002 g. Compute the mass of an electron.

Soln:

Sodium atom and ion differ by one electron. For 100 moles each of sodium atoms and ions there would be a difference of 100 moles of electrons.
Mass of 100 moles of electrons= 5.48002 g
Mass of 1 mole of electron = 5.48002 / 100 g
Mass of one electron = $5.48002 / 100 \times 6.022 \times 10^{23}$
$= 9.1 \times 10^{28}$ g
$= 9.1 \times 10^{-31}$ kg

28. Cinnabar (HgS) is a prominent ore of mercury. How many grams of mercury are present in 225 g of pure HgS? Molar mass of Hg and S are 200.6 g mol–1 and 32 g mol–1 respectively.

Soln:
Molar mass of HgS = The molar mass of Hg + the molar mass of S
= 200.6 + 32 = 232.6 g mol^{-1}
1molecule of HgS contains 1 atom of Hg
232.6 g of HgS contains 200.6 g of Hg
Therefore, Mass of Hg in 225 g of HgS = $\frac{200.6}{232.6}$ X 225 = 194.04g

29. The mass of one steel screw is 4.11g. Find the mass of one mole of these steel screws. Compare this value with the mass of the Earth (5.98×10^{24}kg). Which one of the two is heavier and by how many times?

Soln:
One mole of screws weigh = 2.475×10^{24}g
= 2.475×10^{21} kg

Mass of the Earth / Mass of 1 mole of screws = $\frac{5.98 \times 10^{24} \text{ kg}}{2.475 \times 10^{21}}$

= 2.4 ×10

Mass of earth is 2.4×10^{3} times the mass of screws
The earth is 2400 times heavier than one mole of screws

30. A sample of Vitamin C is known to contain 2.58 ×1024 oxygen atoms. How many moles of oxygen atoms are present in the sample?

Soln:

We know,
1 mole = 6.022×10^{23}
The number of moles= $\frac{\text{Given number of particles}}{\text{Avogadro Number}}$

$$n = \frac{2.58 \times 10^{24}}{6.022 \times 10^{23}}$$

n= 4.28 mol

31. Raunak took 5 moles of carbon atoms in a container and Krish also took 5 moles of sodium atoms in another container of same weight.
(a) Whose container is heavier?
(b) Whose container has more number of atoms?

Soln:

a) Mass of sodium atoms carried by Krish = (5 ×23) g = 115 g

Atomic weight of Na = 23

While mass of carbon atom carried by Raunak = (5 ×12) g = 60g

b) Thus, Krish's container has more number of atoms

32. Fill in the missing data in the Table 3.1

Species property	**H_2O**	**CO_2**	**Na atom**	**$MgCl_2$**
No of Moles	**2**	**-**	**-**	**0.5**
No of particles	**-**	**$3.011x10^{23}$**	**-**	**0**
Mass	**36g**	**-**	**115g**	**0**

Soln:

Species property	H_2O	CO_2	Na atom	$MgCl_2$
No of Moles	2	0.5	5	0.5
No of particles	$12.044x10^{24}$	$3.011x10^{23}$	$3.011x10^{23}$	$3.011x10^{23}$
Mass	36g	22g	115g	47.5g

33. The visible universe is estimated to contain 1022 stars. How many moles of stars are present in the visible universe?

Soln:

Number of moles of stars $= \frac{1022}{6.023 \times 1023}$

= 0.0166 moles

34. What is the SI prefix for each of the following multiples and submultiples of a unit?

(a) 103
(b) 10–1
(c) 10–2
(d) 10–6
(e) 10–9
(f) 10–12

Soln:

a) 103 = 1000= kilo

(b) 10–1 =1/10= 0.1= deci

(c) 10–2 =1/100 = 0.01= centi

(d) 10–6 = 0.000 001= micro

(e) 10–9 =0.000 000 001 = nano

(f) 10–12=0.000 000 000 001 = pico

35. Express each of the following in kilograms
(a) 5.84×10-3 mg
(b) 58.34 g
(c) 0.584g
(d) 5.873×10-21g

Soln:

(a) 5.84 × 10^{-3} mg = 5.84 ×10^{-9} kg

(b) 58.34 g =5.834 ×10^{-2} kg

(c) 0.584g =5.84 ×10^{-4} kg

(d) 5.873×10^{-21}g=5.873 ×10^{-24} kg

36. Compute the difference in masses of 103 moles each of magnesium atoms and magnesium ions. (Mass of an electron = 9.1×10–31 kg)

Soln:

Mg2+ ion and Mg atom differ by two electrons.
103 moles of Mg2+ and Mg atoms would differ by
10^3 × 2 moles of electrons
Mass of 2 ×10^3 moles of electrons = 2×103 × 6.023 ×1023 × 9.1 ×10^{-31} kg
2×6.022 × 9.1×10^{-5}kg
109.6004 ×10^{-5} kg
1.096 × 10^{-3}kg

37. Which has more number of atoms? 100g of N2 or 100 g of NH3

Soln:

No. of moles of atoms = weight / atomic weight.
For N_2
100 gms of N_2 = 100/2 x 14 moles = 100/28 moles
Number of molecules = 100 / 28 x 6.022 x 10^{23}
Molar mass of N_2 = 2 x molar mass of monoatomic N
Molar mass of N_2 = 2 x 14.0067 = 28 moles.
Number of molecules = 100/28 x 6.022 x 10^{23}
No. of atoms = 2 x 100/28 x 6.022 x 10^{23} = 43.01 x 10^{23}
For NH_3

100 gm of NH_3 = 100/17 moles
Number of molecules = 100/17 x
6.022 x 10^{23} molecules
No. of atoms in NH_3 = (1 + 3) = 4 x 100/17 x 6.022 x 10^{23} =
141.69 x 10^{23} atoms.
Therefore, NH_3 has more atoms than N_2.

38. Compute the number of ions present in 5.85 g of sodium chloride.

Soln:

58.5 g NaCl contains 6.023 x 10^{23} molecules
therefore 58.5 g NaCl contains 12.046 x 10^{23} ions.
Hence, 5.85 g NaCl contains $\frac{5.85 \times 12.046 \times 10^{23}}{58.5}$
= 1.2046 x 10^{23} ions

39. A gold sample contains 90% of gold and the rest copper. How many atoms of gold are present in one gram of this sample of gold?

Soln:

One gram of gold sample will contain $\frac{90}{100}$ = =0.9g of gold

Number of moles of gold=$\frac{\text{mass of gold}}{\text{atomic mass of gold}}$

$= \frac{0.9}{197}$

= 0.0046

One mole of gold contains NA atoms = 6.022×10^3

Therefore, 0.0046 mole of gold will contain= 0.0046×6.022
$=2.77 \times 10^{21}$

40. What are ionic and molecular compounds? Give examples.

Soln:

While forming some compounds, atoms gain or lose electrons, and form electrically charged particles called ions. Compounds that are formed by the attraction of cations and anions are called as ionic compounds.
Ex : 2Na + Cl2 → 2Na+ Cl- → 2NaCl (sodium chloride- common salt.)
Sodium is a group 1 metal, thus forms a +1 charged cation. Chlorine is a non-metal, and has the ability to form a -1 charged anion.

Compounds formed due to bonding of uncharged ions are called as molecular compounds and the bonding between them is called covalent bonding. Molecular compounds are formed by sharing of electrons between the two atoms and the elements are held together by covalent bonds.

Ex: 2C + O2 → 2CO (Carbon monoxide)

41. Compute the difference in masses of one mole each of aluminium atoms and one mole of its ions. (Mass of an electron is 9.1×10–28 g). Which one is heavier?

Soln:

Mass of one mole of Aluminium atom = {13 × mass of each electron + 13 × mass of each proton + 14 × mass of each neutron} × Avogadro's constant.
We know, if atoms convert into ions, only transfer of electrons takes place, in Al+3 ion, Aluminium atom loss three electrons,
So,
Mass of Al+3 ={10× mass of each electron +13 × mass of each proton + 14 × mass of each neutron} Avogadro's constant
Now,
You see mass of aluminium atom is greater than aluminium ion by 3 electrons
Difference in mass =Mass of Aluminium atom -mass of aluminium ion
= 3 × mass of each electron x Avogadro's constant .
= $3 \times 9.1 \times 10^{-28} \times 6.023 \times 10^{23}$
= $27.3 \times 10^{-28} \times 6.023 \times 10^{23}$ g
= 164.4×10^{-5} g
= 1.644×10^{-3} g
= 0.0016 g

42. A silver ornament of mass 'm' gram is polished with gold equivalent to 1% of the mass of silver. Compute the ratio of the number of atoms of gold and silver in the ornament.

Soln:
Mass of silver = m g
Mass of gold = m /100g
Number of atoms of silver = Mass/ Atomic mass X NA
= m /108NA Number of atoms of gold
= m/ 100 X197
Ratio of number of atoms of gold to silver = Au : Ag
= m/ 100 X 197 X NA : m/ 108 NA
= 108 : 100×197
= 108 : 19700 =
1 : 182.41

43. A sample of ethane (C2H6) gas has the same mass as 1.5 ×1020 molecules of methane (CH4). How many C2H6 molecules does the sample of gas contain?

Soln:

6.02×10^{23} molecules of methane = 1 mole
Hence 1.5×10^{20} molecules of methane = $(1.5 \times 10^{20} \times 1) \div (6.02 \times 10^{23})$ moles
= 2.49×10^{-4} moles
Molar mass of Methane (CH_4) = 12 + 1x4 = 16 g

Mass of methane = molar mass x no. of moles = 16 x 2.49 x 10^{-4} = 3.984 x 10^{-3} g (This is the same mass as Ethane)
Ethane (C_2H_6) = 12x2 + 1x6 = 30
If 30 g of Ethane has 6.02 x 10^{23} molecules
So 3.984 x 10^{-3} g = (3.984 x 10^{-3} x 6.02 x 10^{23}) ÷ 30
= 8 x 10^{19} molecules of Ethane

44. Fill in the blanks
(a) In a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is called ————.
(b) A group of atoms carrying a fixed charge on them is called ————.
(c) The formula unit mass of Ca3 (PO4) 2 is ————.
(d) Formula of sodium carbonate is ———— and that of ammonium sulphate is ————.

Soln:

Answers

a) Law of conservation of mass
b) Ions
c) 310

Explanation

3 × atomic mass of Ca+ 2 × atomic mass of phosphorus + 8 × atomic mass of oxygen) = 310

3 × 40 + 2 × 31 + 8 × 16 = 120 + 62 + 128 = 310

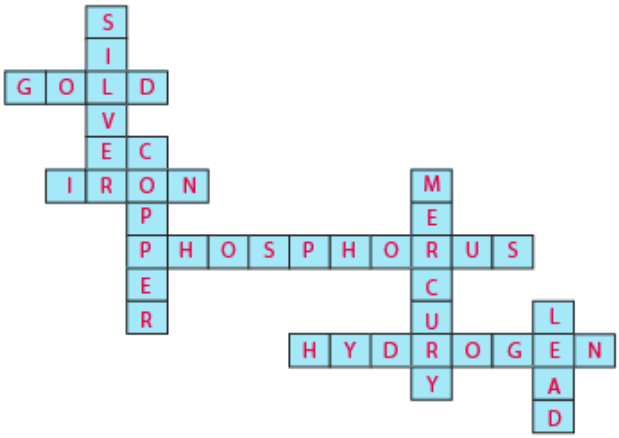
d) Na2 CO3 and $(NH_4)_2SO_4$

45. Complete the following crossword puzzle (Fig. 3.1) by using the name of the chemical elements. Use the data given in Table 3.2.

Across	Down
The element used by Rutherford during his α–scattering experiment	**A white lustrous metal used for making ornaments and which tends to get tarnished black in the presence of moist air**
An element which forms rust on exposure to moist air	**Both brass and bronze are alloys of the element**
A very reactive non–metal stored under water	**The metal which exists in the liquid state at room temperature**
Zinc metal when treated with dilute hydrochloric acid produces a gas of this element which when tested with burning splinter produces a pop sound.	**An element with symbol Pb**


2

Soln:


S
I
G O L D
V
E C
I R O N
M
P E
P H O S P H O R U S
E C
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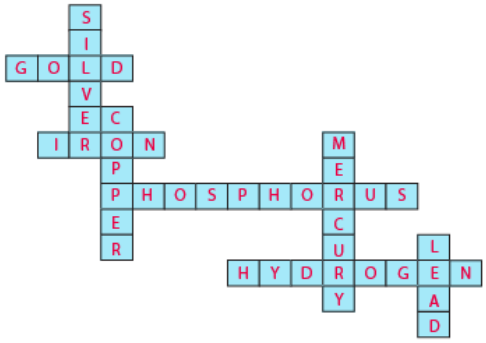
L
H Y D R O G E N
Y A
D


S
I
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Y A
D

46. (a) In this crossword puzzle (Fig 3.2), names of 11 elements are hidden. Symbols of these are given below. Complete the puzzle. 1. Cl 7. He 2. H 8. F 3. Ar 9. Kr 4. O 10. Rn 5. Xe 11. Ne 6. N

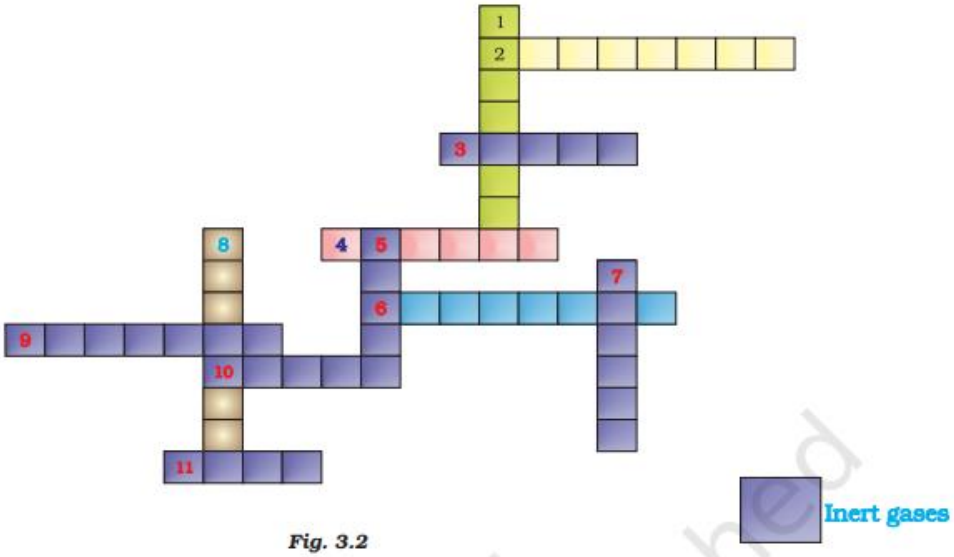
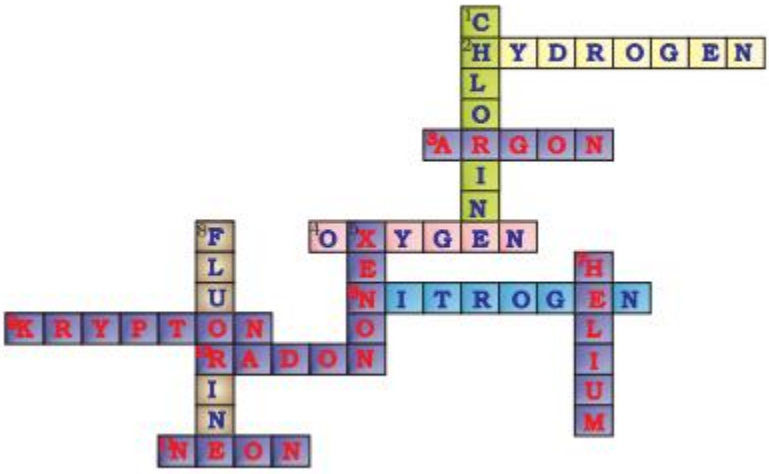


Fig. 3.2

Soln:

(a)



b) Six : Helium (He); Neon (Ne); Argon (Ar); Krypton (Kr); Xenon (Xe); Radon (Rn).

47. Write the formulae for the following and calculate the molecular mass for each one of them.
(a) Caustic potash
(b) Baking powder
(c) Lime stone
(d) Caustic soda
(e) Ethanol
(f) Common salt

Soln:

The formulae for the following and calculate the molecular mass for each one of them.

Sl No	Compound	Formula	Molecular mass
A	Caustic Potash	KOH	39+16+1=56u
B	Baking powder	$NaHCO_3$	23+1+12+3x16+84u
C	Lime stone	$CaCO_3$	40+12+3x16+100u
D	Caustic soda	NaOH	23+16+1+40u
E	Ethanol	C_2H_5OH	2x2+5x1+16+1+46u
F	Common Salt	NaCl	23+35.5=58.5

48. In photosynthesis, 6 molecules of carbon dioxide combine with an equal number of water molecules through a complex series of reactions to give a molecule of glucose having a molecular formula $C_6 H_{12} O_6$. How many grams of water would be required to produce 18 g of glucose? Compute the volume of water so consumed assuming the density of water to be 1 g cm^{-3}.

Soln:

6CO2 + 6 H2 O Chlorophyll /Sunlight → C6 H12 O6 + 6O2
1 mole of glucose needs 6 moles of water 180 g of glucose needs (6×18) g of water 1 g of glucose will need 108/ 180 g of water.
18 g of glucose would need (108 /180) × 18 g of water = 10.8 g
Volume of water used = $\frac{\text{Mass}}{\text{Density}}$
= 10.8 g/ 1g cm-3
=10.8 cm3